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ABSTRACT

The New York Collaborative for Excellence in Teacher Preparation (NYCETP) project has three main goals: (1) fostering the development of collaboration within and between the five campuses of the City University of New York and New York University; (2) faculty development; and (3) the design and development of curriculum. The use of NYCETP faculty to conduct the case studies and review course documents of new and revised courses served many of the goals of the NYCETP and focused the curriculum revisions during the second year. The case study was reported to have strengthened one professor's commitment to NYCETP efforts and increased the potential for collaboration with members on other campuses. The discussions that resulted facilitated individual faculty member's course revisions. (Contains 12 references and a case study outline.) (ASK)

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ED 423 145

Faculty case studies of revised mathematics courses within NYCETP: Process, findings, and unanticipated outcomes

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Paper presented as part of a symposium, "Approaches to Evaluation of Reform-based College Mathematics and Science Courses Funded through NSF Collaboratives for Excellence in Teacher Preparation (CETP)" (Carol Kehr Tittle, Chair), conducted at the annual meeting of the American Educational Research Association, San Diego, CA, April, 1998.

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Introduction

The New York Collaborative for Excellence in Teacher Preparation (NYCETP or "the Collaborative") is a project jointly undertaken by five college campuses of the City University of New York (CUNY) and New York University (NYU). The project is funded by the National Science Foundation (NSF), with additional support from the participating institutions. Among others, the main goals of the Collaborative during the first three years include: (1) fostering the development of collaboration within and between the five campuses of CUNY and NYU; (2) faculty development emphasizing curriculum and teaching standards such as the National Council of Teachers of Mathematics (NCTM, 1989) and the National Research Council (NRC, 1994) Standards documents; and (3) the design and development of curriculum. Although there are other important goals (e.g., recruitment of math and science teachers and increasing numbers of underrepresented populations within the teaching profession), these specific objectives form the basis for the Liberal Arts and Science course reform and programmatic change that are the NSF CETPs' purpose.

Within non-experimental applied research contexts and particularly when educational reform is the object of evaluation, theory plays an important role in strengthening causal interpretations (Cook & Campbell, 1979; Lipsey, 1994). Cook and

Campbell separate out and explicitly identify the issues of the construct validity of causes (treatments) as well as effects. The idea of construct validity of the treatment, the "black box" or treatment theory characterized by Lipsey, is that the causal analysis is "... strengthened by an explicit theory about the nature and details of the change mechanism through which the cause of interest is expected to produce the effect(s) of interest" (Lipsey, 1994, p. 6).

Current educational reform derives from changing perspectives on teaching and learning. The "black box" in the Collaborative's reform efforts is the classroom. The NCTM and NRC Standards documents are based on theories of knowledge construction and instruction that can be broadly characterized as developmental and apprenticeship in their orientation (Farnham-Diggory, 1994) or constructivist, emergent and sociocultural (Cobb & Yackel, 1996). Therefore, the roles of teacher and student, classroom interactions and tasks, and the nature of student outcomes are necessarily changing.

Similarly, the role of theories or models of evaluation are also under consideration. For example, O'Sullivan (1995) examines the emerging roles of evaluation in science education reform, Frechtling (1995) considers the strategies for non-traditional program evaluation, and others have archived reform projects through the use of case studies (Stake, et al., 1993; Trumbull, 1993a, 1993b). From these perspectives, evaluation efforts can

serve to foster and shape reform efforts.

Traditional evaluation design calls for pre- and post-intervention assessment. Some of the NYCETP formative evaluation activities have focused on end of the year course evaluations and pre- and post-course attitude changes. In terms of standardized student outcome measures, New York State has recently begun the administration of the first level of the teacher certification examinations, the Liberal Arts and Science Test (LAST). Beginning in 1997, each college campus is provided information from this examination, thus serving as a potential source of baseline data and a continuing source of data. However, the usefulness of data from exams such as the LAST depends upon the degree to which the courses in Liberal Arts and Sciences and Teacher Education are changing. That is, only when the fidelity of the agent of change (e.g., classroom instruction) is examined and documented can we begin to derive causal hypotheses related to the effect of the treatment.

Thus, the formative evaluation practices of the NYCETP have been focused on facilitating faculty development, providing baseline data, documenting change within the Collaborative courses, developing peer reviews of course documents, and to a lesser degree assisting interested faculty in end of year course evaluations. The faculty case studies described here are an attempt to directly facilitate the goals of the Collaborative. That is, they were carried out to facilitate the attainment of

the first two goals, fostering collaboration between faculty on different campuses and facilitating faculty development, while stimulating the Collaborative's efforts to begin accomplishing the third goal, development of curriculum. Faculty were identified to write the case studies and to be "case studied" with the goal of fostering interactions between individuals teaching similar courses at different institutions. In addition, the process of reviewing a course in great depth or of being studied by another faculty member was reported, in follow-up interviews, as having helped the individual faculty to focus on their own course revisions. This served the goal of faculty development and facilitated the beginning developments of course reform.

Methods

Participants

During the first year of the NSF funded project, each Collaborative campus identified a number of courses for revision. In order to provide a baseline for comparing existing courses with revised courses, the NYCETP internal evaluators asked the NYCETP principal investigators (PIs) to identify one (or two) courses on each campus for detailed documentation. In addition, the PIs were asked to identify faculty on their campuses who teach courses similar to those identified for study to carry out the case studies.

Year one case studies included six mathematics courses and

one science course on six campuses. These courses were studied by seven faculty. In some cases there was a reciprocal arrangement (i.e., faculty from campus A studied a course at campus B and vice versa) and some faculty were involved with more than one case study. In other cases both a Liberal Arts and Sciences and a Teacher Education faculty member were involved in a case study. A total of ten faculty members from six campuses were involved.

Procedures and Case Study Outline

Tittle and Pape (1996) developed a framework to describe and classify procedures and instruments which intend to measure reform in school mathematics and science classrooms. This framework is based on the classification of teacher and student activities and interactions in classroom processes. It emphasizes features of reform-based classrooms such as subject matter, classroom interactions, types of knowledge and cognitive processes, methods and procedures, and teacher knowledge and beliefs.

Drawing on this framework, a Case Study Outline (Appendix A; May, 1996) was developed for use with reform-based post-secondary courses sponsored by NYCETP. The purpose of this outline was to provide faculty members with guidelines for writing the case studies so as to increase uniformity of the final products. The Case Study Outline for year one included the following categories: context, target population, faculty background, physical facilities, curriculum and materials, instructional

methods, student outcomes and assessments, faculty roles, cross-discipline and field site collaboration, and course revision plans. These baseline reports provide information about the courses before revision as well as faculty practices and beliefs at that time.

Once individuals and courses were selected for the case studies, information which included general instructions for the faculty members writing the case studies and those who taught the course to be studied as well as the Case Study Outline (Appendix A) was distributed. The year one case studies were developed during June and July 1996 through meetings with course faculty, campus visits, and examination of course documents.

During October 1996, we conducted a follow-up interview with each faculty member involved in the case studies (see Appendix B; Memo to NYCETP case study participants, October 9, 1996). During these interviews, the participants were asked to comment on the case study process, the usefulness of the outline, specific categories included on the outline, and course materials and information which might be included for dissemination within and beyond NYCETP. These interviews lead to the revision of the outline (see Appendix C, NYCETP Year 3 Case Study Outline) which includes six broad areas of inquiry: (1) general overview and context; (2) students -- target population; (3) course revisions; (4) new/revised course specifications; (5) student outcomes and assessments; and (6) faculty roles. This revised outline is

presently being used to conduct post-revision case studies of some of the same courses as in year one.

Results and Discussion

The documentation of individual courses through faculty case studies was designed to serve several purposes: (1) to provide baseline data for courses that were to be revised; (2) to foster the goals of the Collaborative itself such as faculty development; and (3) to stimulate course development and reform. For the first purpose, the year one case studies provide baseline information (e.g., course syllabi, instructional activities and materials, and types of assessments) for comparison versus that produced for revised courses. For example, the case studies provide an overview of seven of the courses that are being revised through NYCETP funding. More specifically, a listing of all assessment measures described in the baseline case studies has been developed and will be used for comparison against those in the revised courses.

Many of the year one courses are being case studied again during year three of the project (Spring, 1998). These follow-up case studies, along with the formal documentation for the revised courses, will serve as materials to contrast those produced for the baseline case studies. These materials may also be examined for their fidelity to the NCTM and NRC standards documents.

For the second purpose, the process of carrying out the study was designed to support and facilitate overall NYCETP

goals. The case studies were intended to foster collaboration between faculty on different campuses who teach similar courses. The case studies included faculty from all six NYCETP campuses. Also, two of the case studies were written by both a Liberal Arts and Sciences and an Education faculty member. This supports the NYCETP goal of fostering the interaction between faculty members across departments, disciplines and across institutions.

For the third purpose, the in-depth examination of specific courses by both the individual teaching the course and the faculty member who wrote the case study served as both a means of staff development and, for many, a vehicle through which the process of course revision was begun. That is, while the case studies provided baseline data related to the courses to be revised, they also resulted in faculty visiting other campuses with a specific goal and focusing their interactions and discussions on particular aspects of the curricula. These individuals later reported conversations related to teaching activities, to the selection of topics included in the particular courses, and to the assessment of student understandings and attainments, among others. This served to focus the course revisions more concretely across campuses.

Follow-up interviews (Appendix B) were conducted of faculty who wrote the case studies and of faculty whose courses were studied. These interviews provide faculty perspectives on the process and use of case studies. Overall, the participants

reported that the outline provided a framework from which they could write the case study. Most of the faculty members were not familiar with writing a document such as a case study. Therefore, they reported that the outline was necessary and important in focusing their discussions and writing. Since the level of prior knowledge of the students at the different NYCETP campuses is an important consideration, the faculty suggested the expansion of Category II, target population, to include not only preparation for the course but also remedial needs, math anxiety, etc. This resulted from many of the faculty members' concerns for the identification of weaker students enrolled in particular mathematics courses. Finally, the faculty suggested that several of the categories (i.e., curriculum and materials, instructional methods, and student outcomes and assessments) may be more appropriately part of a self-study process, and this is taking place through the development of course documentation following course revision.

Unanticipated outcomes

Unanticipated outcomes of the case studies include the importance of the interactions in fostering collaboration between faculty members on different campuses and in developing their understanding of reform-based teaching and learning. Through in-depth visitations of the various campuses, such things as the facilities available and/or necessary to provide reform-based courses became clear to the faculty. One faculty member reported

that she was better prepared to provide a request for space and materials than she had been prior to writing the case study.

During the follow-up interview, some of the faculty highlighted the importance of the "faculty roles" section of the outline while another faculty member expressed concern for why this section was included because it "provided awkward moments in the faculty interview." This concern is notable in itself. This section provided an opportunity for the faculty to reflect upon their view of the role they play in their students' learning, but, for some, this reflection was subsequent to wondering why this section would be included within the case study outline.

With respect to changes in the faculty member's thinking, many of the faculty reported that the case study process influenced their thinking related to the revision of their courses. The following were mentioned as changes due to participating in the case study: the incorporation of more computer graphics and simulations, an evaluation of the entrance requirements for particular courses in order to clarify these requirements, the need to increase collaboration among students and the use of manipulatives as integral parts of the course, the need for greater coherence between math and math education courses. For some, the difficulty inherent in collaboratively revising courses (i.e., collaboration between Liberal Arts and Sciences faculty and Education faculty) became more apparent. These two groups of individuals typically come to the revision

process from different perspectives. One professor wrote:

> I am experiencing first hand how difficult it is to plan and tryout activities with colleagues who are not committed to course revision that requires major change in principles of teaching - such as deciding to cover fewer topics in a course but covering them in more depth, or taking sufficient time for hands-on activities and follow-up discussion before moving to a lecture-discussion of materials. At one of the meetings I heard faculty speak of themselves as a biologist or chemist but not as educators, and this causes me much concern because it suggests that we are not beginning with the same goals and expectations for courses and instruction. Perhaps faculty at different ends of the continuum on such issues will each move closer to a middle position. on the positive side, I am happy with students' comments about tryout of some activities. The question is how do our efforts lead to substantive change in the actual courses - especially in content areas.

In summary, the use in evaluation of NYCETP faculty to conduct the case studies and to review course documents of new and revised courses served many of the goals of the Collaborative and focused the curriculum revisions during year two. The case study was reported to have served to strengthen one professor's commitment to the Collaborative efforts and increased the potential for collaboration with members on other campuses.

Finally, the discussions which resulted facilitated individual faculty member's course revisions, one of the main formative goals in the beginning stages of the Collaborative.

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APPENDIX A

CASE STUDY OUTLINE
NYCETP May 1996

The outline is provided to guide your documentation of the Collaborative course. The goal is to attain similarity between the case studies of the courses on different campuses. Please use the categories/questions to guide your interviewing and writing. Collect all materials that are available for the course and that may be included to illustrate your case descriptions. Note that not all categories/questions will be relevant to any particular course.

Identifying information:
Instructor's name, Department, Title/Position, course title and section, campus.

I. Context

Briefly, describe the institution-large, urban, enrollment size, characteristics of student body, physical appearance of campus.

Describe the course-- department in which taught, number of hours per week, broad goals and expected outcomes; where does it fit within the college/university? liberal arts & science dept? teacher education? required, elective? foundation or core course? for whom? other students enroll? several sections offered, different faculty and/or adjuncts teach?

Course history (how long in curriculum, etc.) and reasons for changing and general goals of change

II. Students: What is the target population?

Describe 2-3 typical students--age, gender, ethnicity, SES, background, recruitment of students for course, preparation for course; freshman, sophmores, etc.; likely educational and career goals;

III. Faculty

Describe relevant educational background, pertinent experience, years teaching this course; etc.

IV. Physical facilities for course

Describe room(s)/labs/etc. where instruction usually occurs; technological support (computers, video taping equipment, VCRs), other equipment; other supporting resources --science or math centers etc.

How frequently are labs, support technology, etc., used by students?

V. Curriculum and materials

Topics and domains, sequence, course syllabus, reading lists, assignments, text (full reference: author, title (edition), date, publisher).

Criteria for selection of: topics, sequencing, demonstrations, student activities, etc.

Describe two to three classroom activities in detail. How do these activities reflect the goals of the course? How do the activities foster greater understanding of the concepts/processes within the topic (science, math)? How could these activities be easily adapted by prospective teachers for use in their classrooms?

VI. Instructional methods

What is the predominant mode of instruction or pedagogical approach in the course (e.g., lecture, demonstration, recitation/drill, group work, independent work, etc.)?

Describe what happens during a "typical" class? a lab? during use of a computer center or (media, curriculum materials) center? in discussion groups? in other instructional settings? (Ex., teacher and/or student use of lecture, written presentations; demonstrations; concrete models (including manipulatives), pictoral models; equations/formulas; graphical; field work, laboratory work (describe--pre-set experiments or inquiry based; types of mathematial problems)

Reasons for and/or criteria for decisions to use particular instructional methods, activities, and assignments.

VII. Student outcomes and assessments

Describe assessments/evaluation of students: What is the predominant method of assessment? How does this form of assessment provide evidence of course goal attainment?

Collect sample assessments/tasks etc. Examples may include paper and pencil examinations such as multiple choice/open-ended questions with student responses and faculty evaluation, if possible. (Blank out student names.) Other examples might be written papers, oral presentations, videotapes, logs, portfolios, etc.

Reasons for and/or criteria for decisions to use particular types of assessments and evaluations.

Overall, what impact do you think this class has had on students as prospective teachers (e.g., student knowledge, understanding, and attitudes toward the subject matter)? Please provide specific examples or anecdotes to illustrate these impacts.

VIII. Faculty roles: questions for faculty

How do you view your role as an instructor in relation to student learning and outcomes in this course?

How do you view mathematics (or science) as a discipline?

How do you view science (or mathematics) education as a discipline?

What do you see as your role in the preparation of teachers?

IX. Cross discipline collaboration

Does the course reflect an integration of mathematics, science, and technology? How is this integration achieved?

Does it reflect an integration of teacher preparation goals and the discipline? How is this achieved? Are discipline and education faculty both involved? How?

X. School and field site collaborations

Does this course involve the collaboration of experienced or master teachers? school district coordinators or others? the observations of school students? the use of field sites? Describe how.

XI. Course revision/development

Are you involved in the revision of this course? How? What are your plans for revisions? Who else is involved with and participating in the revision process? (Please query specifically for involvement of these groups: education students, student teachers, beginning teachers, cooperating teachers, experienced or master school teachers, education and liberal arts faculty members, outside agencies/institutions.)

Do any of these plans involve student recruitment? collaboration across CUNY or other campuses?

Pape/Tittle evcase3
5/15/96

APPENDIX B

THE
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THE CITY UNIVERSITY OF NEW YORK

PH.D. PROGRAM IN EDUCATIONAL PSYCHOLOGY
33 WEST 42 STREET, NEW YORK, NY 10036-8099
212 642-2261

October 9, 1996

Memo to: NYCTEP Case study participants
NYCTEP Principal Investigators

From: Carol Tittle, Stephen Pape

RE: Case Study Follow-up

In order to build on the excellent work started with the case studies, we are writing to ask your help in the planning for next steps. The possibilities under consideration are to continue with additional case studies next spring/summer and to try to link the case studies with the development of new and/or revised course curricula.

You can help by reflecting on and evaluating the initial case studies and the (attached) case study outline for 1996 with several specific purposes in mind:

1. Will the case study outline be useful again next year for similar case studies?

2. Looking both at the case studies and the outline, what should be in a set of materials prepared for the new/revised courses to be disseminated <u>within</u> the NYCETP faculty?

3. Long range, what should be in a set of materials that would serve as sufficient documentation of the course that could be disseminated outside the Collaborative campuses?

4. (in addition) Have there been any specific changes to your own thinking, practices, planning, etc., as a result of participating in the case study process?

As a first step, we would appreciate your written responses to these four questions. <u>Please respond by October 30.</u> Responses can be forwarded by e-mail or (snail) regular mail. Regular mail to C. Tittle (above); e-mail to spape@email.gc.cuny.edu. We are also planning to do follow-up interviews. If you have questions, please contact C. Tittle at (212) 642-2254. (evcase4)

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HUNTER COLLEGE
JOHN JAY COLLEGE OF CRIMINAL JUSTICE
KINGSBOROUGH COMMUNITY COLLEGE
LA GUARDIA COMMUNITY COLLEGE
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MOUNT SINAI SCHOOL OF MEDICINE (AFFILIATED)
NEW YORK CITY TECHNICAL COLLEGE
QUEENS COLLEGE
QUEENSBOROUGH COMMUNITY COLLEGE
YORK COLLEGE

Date: March 13, 1998

Memo to: NYCETP Case study participants
NYCETP Principal Investigators

From: Carol Tittle, Stephen Pape

Re: NYCETP Year 3 Case Study Outline

Begin the case study with an introductory page that describes the special characteristics of this course relative to the NYCETP collaborative goals:

- Increased use of inquiry-based approaches.
- Opportunities for hands-on, experiential learning.
- Focus on deep understanding of major concepts.
- Increased use of technology in effective ways.
- Use of an "urban context."
- Incorporation of alternative assessment approaches.
- Partnership of science/mathematics faculty and education faculty.
- Partnership of science/mathematics faculty and K-12 teachers.

Use the following outline to guide your documentation of the Collaborative course. The goal of providing this outline is to attain similarity between the case studies on different campuses. Please use the categories and questions to guide your interviewing and writing. Collect <u>all</u> materials that are available for the course and that may be included to illustrate your case descriptions.

I. <u>General Overview and Context:</u>

1. Instructor's name, department, title/position, course relevant experience/education, years teaching this course.
2. Title of course, number of hours and credits.
3. Catalogue description, placement of course in sequence, required core courses or other prerequisites, required course or elective.
4. Typical number of sections offered per semester, description of faculty who teach sections other than interviewee (i.e., number and percentage full-time versus adjunct or part-time faculty, pertinent experience, etc.).
5. Entering requirements such as grade point average or score on a diagnostic assessment.

6. Organization or breakdown of hours for each class session or hours per week (i.e., lecture, recitation, and lab hours).
7. Brief description of institution, total enrollment size, characteristics of student body.
8. Brief history of course, evolution of course over time (prior to NYCETP revisions) and broad goals or circumstances for changes.

II. Students - Target Population:

1. Course enrollment size, intended population (level of students, i.e., first year, major, teacher education student, etc.),
2. Description of several "typical" students (i.e., age, gender, ethnicity, SES, background, likely career goals or major).

III. Course Revisions or Development as Part of NYCETP Activities:

1. Name(s) of college faculty who revised/developed the course as part of NYCETP efforts. Others who have helped planning or revising course(s)? Did members of the Liberal Arts faculty and the Education faculty collaborate on the revision or development of the course (describe collaborative efforts)?
2. Overview of new or revised course including characteristics specifically related to particular NYCETP goals.
3. When was the new or revised course offered for the first time (or when will it be offered)? Will it be offered again? When?
4. Differences between new/revised course and the course that was originally offered (e.g., how has course structure or allocation of class time changed, how are goals and expected outcomes different, etc.).
5. Does this course involve the collaboration of experienced or master teachers, school district coordinators or others? Are exemplary field sites (i.e., classroom observation or student-teaching sites) being developed in conjunction with the new or revised course? Describe the use of such sites.
6. How is the impact of revisions on prospective teachers being evaluated? Have additional revisions been planned as a result of such an evaluation of the revised course?
7. Plans for revision not yet implemented or fully developed. Do these plans include provisions for the recruitment of teachers?
8. How has revising or developing the course changed your (i.e., the faculty who revised the course) thinking related to learning and teaching?

IV. New/Revised course specifications:

1. Course objectives.
2. Statement of course philosophy. Statement of goals for revision or development of the course.
3. Syllabus including a listing of the focus for each session of the course, sequence of topics, corresponding materials/resources, readings, other assignments or assessments, references, etc.
4. Full reference for required text.
5. List of specific activities and major investigations that will be used for a given session/topic. How do these activities reflect the goals and objectives of the course? How will they strengthen student understandings? How do they reflect the processes within the domain (i.e., math or science)? How might they be adapted by the student to use in his or her own (future) teaching?
6. Predominant instructional modes/methods - detailed description of a "typical" class session, pedagogical approach taken (e.g., lecture, demonstration, experimentation or inquiry, recitation/drill, group work, independent work, peer tutoring, etc.); what teacher and students were doing throughout the class. Give examples of sample oral questions the instructor used to assess student understanding.
7. Statement of justification or criteria for course objectives, topics, sequence of topics, activities, assignments, instructional practices, etc. (i.e., pedagogically meaningful?).
8. Evidence of cross-disciplinary or cross-campus collaboration. Does the course reflect the integration of mathematics, science and technology? How is this integration achieved?
9. How does this course reflect the integration of teacher preparation goals and/or theories of learning and instruction within the domain (i.e., math or science)?
10. Physical facilities (i.e., laboratory, computers, etc.), description of typical classroom and supporting equipment (i.e., computers, video equipment, VCR and television, etc.). How frequently do students use facilities other than the assigned classroom?

V. Student Outcomes and Assessments:

1. Describe assessment and evaluation practices. What types of assessments are used (i.e., multiple choice, open-ended questions, etc.). **Collect and include examples of tests or other forms of assessment as well as examples of student responses.** Include evaluation/scoring guide: What does the instructor look for in evaluating these examples?
2. How does this form of assessment provide evidence of course goal attainment?
3. Justification and/or criteria for the use of particular forms of assessments.
4. Overall, what impact do you think this class will have or has had on students as prospective teachers (e.g., student knowledge, understanding, and attitudes toward the subject matter)? Please provide specific examples or anecdotes to illustrate these impacts.

VI. Faculty Roles:

1. How do you view your role as an instructor in relation to student learning and outcomes in this course?
2. How do you view mathematics (or science) as a discipline?
3. How do you view science (or mathematics) education as a discipline?
4. What do you see as your role in the preparation of prospective teachers?